

**BMEN 482/682**  
**Polymeric Biomaterials**  
(3 credits)

Spring 2009

**Instructor:** Prof. Melissa A. Grunlan, Ph.D.  
Office: Zachry Engineering Center 336A  
Phone: (979) 845-2406  
[mgrunlan@tamu.edu](mailto:mgrunlan@tamu.edu)  
Office Hours: TW 9:00-10:30 am or by appointment

**Lecture:** MW 4:10-5:25 (ZACH 119C)

**Required Text:** Stevens, M.P. Polymer Chemistry: An Introduction, 3<sup>rd</sup> Edition (Oxford University Press, 1999; ISBN: 0-19-512444-8).

**Prerequisites:** graduate standing or BMEN 343

**Additional References:**

Billmeyer, F.W. Textbook of Polymer Science; 3<sup>rd</sup> Edition (John Wiley & Sons, 1984; ISBN 0-471-03196-8)  
Carraher, C.E., Jr. Seymour/Carraher's Polymer Chemistry; 6<sup>th</sup> Ed.; (Marcel Dekker, Inc., 2003; ISBN: 0-8247-0806-7).  
Odian, G. Principles of Polymerization; 3<sup>rd</sup> Ed.; John Wiley & Sons, 1991; ISBN: ISBN: 0-471-61020-8.  
Sperling, L.H., Ed. Introduction to Physical Polymer Science, 4<sup>th</sup> Ed.; Wiley, 2006; ISBN: 0-471-70606-X.  
Arshady, R., Ed. Introduction to Polymeric Biomaterials; Citus Books, 2003; ISSN: 1479-1285.  
Wnek, G.E.; Bowlin, G.L.; Eds. Encyclopedia of Biomaterials and Biomedical Engineering, Vol. 1 & 2; Marcel Dekker, 2004; ISBN: 0824755626.

*\*These books are not required; however, they may be useful in presenting the course information in a different and potentially useful way.*

**Course Description:**

1. Preparation and properties of polymers, including: polymerization; structure-property relationships; molecular weight and measurement; morphology; thermal transitions; network formation; mechanical behavior; polymeric surface modification; and bioadhesion.
2. In addition, we will explore common polymeric biomaterials and their applications in medicine, such as: tissue engineering scaffolds; biodegradable polymers; hydrogels; anti-fouling/blood-compatible polymers; and shape memory polymers (SMPs).

**Course Objectives:**

1. Develop a fundamental understanding of polymer preparation and structure-property relationships
2. Gain familiarity with polymeric biomaterials used in biomedical applications
3. Verify knowledge transferred through examinations and homework assignments.

**Course Website:** <http://biomed.tamu.edu/biomaterials/> (Click on BMEN 482/682 link)

- Syllabus (syllabus will be updated continually although exam dates will not change except by consensus).
- Occasional Power Point slides (e.g. tables, pictures) presented in lecture (Note: Lecture notes will NOT be posted. The only way to get lecture notes is by attending class or getting them from a generous classmate).
- Homeworks & Answers; Exams & Answers; Supplemental Reading Materials.

**Course Website:** <http://biomed.tamu.edu/biomaterials/> (Click on BMEN 482/682 link)

**What it has:**

- Specific reading assignments and homework assignment dates updated at least each week (make sure you check this regularly!).
- Occasional Power Point slides used in lecture.

**What it does *not* have:**

- Lecture notes (the only way to get lecture notes is by attending class or getting them from a generous classmate)

**Lectures:**

Lecture notes will be your best resource when it comes to studying for exams (as well as completing homework assignments). Your presence and involvement in class will help you to do well and *learn*.

Specific reading assignments will be made *in class*. Handouts will also be provided *in class*. Your *notes from class* will be a primary study tool for exams (along with reading assignments). I encourage class discussion but refrain from idle chatter or other distracting behavior.

Reading the book and supplemental reading assignments will help solidify concepts discussed in class.

Lectures will be presented mainly on the whiteboard. Power Point slides will be occasionally used to show figures, tables, etc.

Questions during the lecture are welcome. Your assistance in creating a good learning environment free of distractions is appreciated by me and your classmates.

**Grading: Point distribution**

**BMEN 482 Students:**

Homework (100 points total – may be scaled)

Manuscript review (25 points) (see below)

Exam 1 (100 points)

Exam 2 (100 points)

Final Exam (200 points)

**TOTAL: 525**

**BMEN 682 Students:**

Homework (100 points total – may be scaled)

Manuscript review (70 points)

Presentation on manuscript (30 points)

Exam 1 (100 points)

Exam 2 (100 points)

Final Exam (200 points)

**TOTAL: 600**

\* Requests for re-grading must be submitted within one week after the work is returned. Material returned for re-grading is subject to re-grading of entire exam/homework. Assignments may be turned in up to 1 day late (by 4 pm the day after the homework is due) for up to 50% credit, after which no credit will be given.

## Course Requirements:

- Homework:** Assignments (about 5-7) will be distributed in-class (and posted thereafter). Assignments will be due at the beginning of class (for full credit) typically 1 week after they are distributed (unless otherwise stated). Some problems may be selected from the book. Assignments should have your **name** and **ID#** in the **upper right corner**. Staple all pages (including original sheet) together. Problem answers should be given in order and neatly with the **final answer in a box** when appropriate. Please use **SI units**. Assignments may be turned in up to 1 day late (by noon the day after the homework is due) for up to 50% credit, after which no credit will be given.
- Exams:** Two hourly exams are closed book/closed notes and will cover *primarily* material from the beginning of class or since the previous exam. Exams are typically a combination of true/false, short answer, concept questions/critical analysis/design and problem solving (number crunching). An equation sheet will be stapled to the back of each exam. This equation sheet will also be distributed sometime before the exam so you can use it to study. Exams may be turned in up to 1 day late (by noon the day after the homework is due) for up to 50% credit, after which no credit will be given.
- Final Exam:** The final exam is comprehensive and closed book/closed notes. Except for greater length, the final exam is quite similar to an hour exam in most respects. Equations sheets will be provided.
- Extra Credit:** There will be a total of “20 points” of bonus questions: 5 pts (exam 1), 5 pts (exam 2) and 10 points (exam 3). Points earned will be added to the point total for that exam. There will be no other opportunities for extra credit.

## **BMEN 682:**

**Manuscript Review:** *An independent and original interpretation of results reported in a peer-reviewed manuscript.*

**Requirements:** (a) Published 2004 or later. (b) published in a journal listed in bold typeface (see list).

**Topic:** A new polymer or polymeric material of relevance for a medial application.

**Length:** minimum of 8 pages to a maximum of 12 pages (double spaced, 11 point type, Times New Roman or equivalent, 1 inch margins, pages numbered, stapled in left hand corner)

**Format (in order, clearly label sections 2 and 3):** (1) **Title page:** Full Citation and author institution(s); journal impact factor (2) **Summary:** Context of research problem and major findings (along with techniques utilized to obtain those findings). Use of figures/tables from manuscript should be used for clarity of your review (do not re-write entire manuscript). Author interpretation of results. (3) **Critical Analysis:** the validity of experimental techniques and interpretation & support of results. Section (3) should be approximately the same page length as Section (2). For this review, you should consult references cited in the manuscript as needed.

**Grading:** adherence to format, clarity of review and emphasis on key results, and depth of critical analysis.

## **Presentation:**

Each student will be required to give an in-class presentation on material covered in their term paper. You will have *10-12 minutes* for the presentation and *3 minutes* for audience (and my) questions. This presentation should be done primarily with “Power Point”; however, you can digress and use the whiteboard to break-up to break the monotony or to help answer audience questions.

**Grading:** clarity, organization, technical content, and familiarity with your subject (i.e. ability to answer reasonable questions).

**Loss of points:** How to lose points: (a) if you exceed your time limit (or go way under), (b) poor quality of slides and poor organization, (c) lack of understanding (can't answer questions) and (d) other. Also, you must attend all days of student presentations or be deducted points from you own. If you miss one day of presentations or you are late to class one day, I will deduct at least 10 points from your score. You will be required to hand in a “3-point summary” for each presenter at the end of class.

**BMEN 482:**

**Manuscript Review:** 4-5 students will each be assigned to read, answer my questions, and write a short summary of one of the manuscripts selected by a 682 student.

**Presentation:**

If you miss one day of presentations or you are late to class one day, I will deduct at least 10 points from your score. You will be required to hand in a "3-point summary" for each presenter at the end of class.

**Key Dates:**

**682: Manuscript selection due: February 16<sup>th</sup> (Monday)\***

**Exam 1: February 25<sup>th</sup> (Wednesday)**

**Exam 2: April 6<sup>th</sup> (Monday)**

**682: In-class presentation (all 482/682 attend): April 27<sup>th</sup> (Monday) and April 29<sup>th</sup> (Wednesday)**

**Final Exam: May 11<sup>th</sup> (Monday): 3:30 – 5:30 pm**

\*bring three "choices" to discuss with Dr. Grunlan before or after class.

**Americans with Disabilities Act (ADA) Policy Statement:**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services ([disability.tamu.edu](http://disability.tamu.edu)) in Room B118 of Cain Hall or call 845-1637.

**Academic Integrity Statement:**

Aggie Honor Code: ***"An Aggie does not lie, cheat, or steal, or tolerate those who do."***

It is the responsibility of students and instructors to help maintain scholastic integrity at the university by refusing to participate in or tolerate scholastic dishonesty (*Student Rule 20. Scholastic Dishonesty, <http://student-rules.tamu.edu>*). New procedures and policies have been adopted effective September 1, 2004. Details are available through the Office of the Aggie Honor System (<http://www.tamu.edu/aggiehonor/>). An excerpt from the Philosophy & Rationale section states: *"Apathy or acquiescence in the presence of academic dishonesty is not a neutral act -- failure to confront and deter it will reinforce, perpetuate, and enlarge the scope of such misconduct. Academic dishonesty is the most corrosive force in the academic life of a university."*

On all course work, assignments, and examinations at Texas A&M University, the following Honor Pledge shall be preprinted and signed by the student: *"On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work."*